

Applicant(s): RICHARD E. FORKEY ET AL.
Serial No.: 10/809,198
Filed: March 25, 2004

In the Specification

Please replace the paragraph beginning at page 3, line 24 as follows:

In accordance with this invention an optical device characterized by an axis includes an optical element on the axis that has first and second faces and an intermediate peripheral surface. An optical element support ~~for defining~~ defines a positive seat for the optical element. A first ~~support portion at an intermediate axial location of the support means~~ engages the peripheral surface. Second integral portions adjacent opposite ends of the first portion engage each ~~and a second support engages at least one of the first and second faces adjacent the peripheral surface whereby the optical element is locked in the optical device to limit motion along the axis.~~

Please replace the paragraph beginning at page 5, line 23 as follows:

FIG. 15 is a longitudinal cross-section of another embodiment of an optical module incorporating this invention;

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Please replace the paragraph beginning at page 9, line 22 as follows:

With the sealing cap 55 removed, a support structure 56 is attached to the end of the optical device 20 and it is lowered into hydraulic oil 57. After the sealing cap 55 is replaced, step 61 controls the operation of a hydraulic pump 61 to raise the pressure to a point at which a plastic deformation of the sheath 21 occurs. A pressure meter 62 monitors this pressure. A pressure relief valve 63 prevents over pressure and serves as a quick release for pressure at the end of the process. When the appropriate pressure is reached portions of the tubular sheath 21 intermediate the lens elements deform so to overlies portions of the lens faces, such as lens faces 45 and 46 in FIG. 3 and capture and lock the lens elements. This deformation conforms the portions of the sheath 21 to the geometry of the faces 45 and 46 adjacent the peripheral surface 47 to limit axial motion of the lenses 43 within the sheath 21.

Referring to FIGS. 7 and 8, application of the hydrostatic pressure to the exterior of the optical device 20 by the media 57 deforms ~~unsupplied-unsupported~~ portions of the tubular sheath 21 between the lens elements 43 into an ovoid shape with portions 64 and 65 lying along a major axis. The lens elements 43 prevent deformation of contiguous portions of the tubular

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sheath 21 that engage the peripheral surface of each of lens elements 43. ~~Consequently~~ Other portions of the tubular sheath 21 overlie ~~overlie~~ both lens faces 45 and 46 at each lens ~~elements~~ element, such as overlayments at 66 and 67 ~~[[on]]~~ at each of the lens elements 43. The resulting transitions to the overlayments 66 and 67 lock the lens elements 43 in place, securely positioning the lens elements within the tubular sheath 21 along the axis 18. If a spacer 44 is used, it is a thin spacer that deforms to conform to the tubular sheath 21. This provides an additional overlayment.

Please replace the paragraph beginning at page 11, line 13 as follows:

FIGS. 9 through 11 depict an alternative to the foregoing hydrostatic process that utilizes a serial crimping process. An initial step 80 involves the construction of an optical device 20 with lenses, spacers, prisms, windows and other optical elements in a housing such as shown in FIGS. 3 and 4. Step 81 aligns the optical device 20 with a first face of a first lens, as a selected lens, at a crimping tool represented by arrows 82. In this case a lens 83, like the doublet lens 43, is selected and a first face 84 is aligned with a crimping tool 82. At step 85 the crimping tool is applied in a plane

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transverse to the axis 18 thereby to form a crimp on opposite sides of the housing in the form of the tubular sheath 21 at the end portion 86 of a spacer ~~[[43]]~~44. In step 87 the optical device 20 and crimping tool are repositioned so the crimping tool aligns with the second face 97 of the selected lens; i.e., at a position represented by ~~arrows 90~~ arrows 90. Step 91 then repeats the crimping process.

Please replace the paragraph beginning at page 13, line 1 with the following:

FIG. 11 depicts an optical device 20 with four diametrically opposed crimp portions 100 and 101 being produced by two manual crimping operations. As also shown particularly in FIG. 10, if spacers ~~[[43]]~~44 are used for initial positioning, they also will be deflected at each of the crimps, such as at the crimps 100 and 101 in FIG. 11.

Please replace the paragraph beginning at page 15, line 17 with the following:

FIG. 3 depicts an optical device 20 in which each spacer 34 bears against opposing lens faces. FIG. 15 depicts an alternative approach by which each lens spacer acts as an

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optical support means and carries a lens element at a predetermined position. For example, FIG. 15 depicts a lens element 140 with first and second lens faces 141 and 142. A spacer 143 carries the lens element 140 as a subassembly or lens module. In this particular application after the lens element is positioned axially in the spacer 143, crimping operations produce crimp sets 144 and 145 thereby to lock the lens element 140 within the spacer 143 with an intermediate spacer portion 146 between the crimps 144 and 145 engaging a peripheral surface 147 of the lens element 140 and produce a module 148. Construction of an optics subassembly such as subassembly [[144]]149, shown in FIG. 16 then involves using a tubular sheath, such as a tubular sheath 21, and, after positioning an end element, such as an objective, inserting modules, such as modules 148A and 148B, as shown in FIG. 15 having appropriate dimensions into the tube in sequence to produce a relay lens system. As will be apparent while the approach in FIG. 15 can be used for a relay lens system, it can also be used for the formation of an objective or the formation of an eyepiece.